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ORIGINAL ARTICLE

Mandibular Guide Flange Prosthesis Following Mandibular Resection: A Clinical Report

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ABSTRACT

Loss of the continuity of the mandible destroys the balance and the symmetry of mandibular function, leading to altered mandibular movements and deviation of the residual fragment towards the surgical side. This clinical report gives a brief review of resection guidance prosthesis and describes the fabrication of an acrylic guidance flange prosthesis. Successful intercuspal position was accomplished through the use of the guidance appliance, combined with physiotherapy in a patient who underwent a hemisection of the mandible, subsequent to treatment for an ameloblastoma.

Key Words: Mandibular guidance therapy, Guide flange prosthesis, hemimandibulectomy

Key Message: In patients who have undergone mandibular resection, correct intercuspal position can be accomplished with the early use of Guide flange prosthesis, combined with physiotherapy.

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Introduction

Surgical treatment for neoplastic lesions of the oral cavity often requires resection involving the mandible, floor of the mouth, tongue and also the palate.[1],[2] While the surgical restoration of the mandibular resections has advanced dramatically with free-flap techniques, oral function and patient perceptions of function, as well as treatment outcomes, often indicate significant impairment.

In patients who have undergone mandibular resection, the remaining mandibular segment will retrude and deviate towards the surgical side, at the vertical dimension of rest. Upon opening the mouth, this deviation increases, leading to the opening and closing of the angular pathway. Loss of the proprioceptive sense of occlusion leads to the uncoordinated, less precise movement of the mandible. The absence of the muscle of mastication on the surgical side results in a significant rotation of the mandible upon forceful closure. When viewed from the frontal plane, the teeth on the surgical side of the mandible move away from the maxillary teeth after the initial contact on the nonsurgical side has been established. As the force of closure is increased, the remaining mandible rotates through the frontal plane. Hence the term 'frontal plane rotation'.[1] This factor, with the addition of impaired tongue function, may totally compromise mastication.

The severity and permanence of mandibular deviation is highly variable and is dependent

upon a number of complex factors such as the amount of soft and hard tissue resected, the method of closure and so forth. Patients who are closed with a myocutaneous or free flap soon attain an acceptable interocclusal relationship with adjunctive therapy, while some patients who are closed primarily, are never able to achieve an appropriate and a stable interocclusal relationship.[1],[2]

The literature shows the varying basic design of prostheses that can be mandibular based or palatal based, anchored on natural teeth or the denture flange, have been employed to reduce or minimize mandibular deviation.[3]

Review Of Literature

Robinson et al. (1964) [4] suggested that if the mandible can be manipulated into an acceptable maxillomandibular relationship, but lacks motor control to bring the mandible into occlusion, a cast mandibular resection restoration is appropriate. They further stated that fabrication of a provisional guide plane facilitates the fabrication of a definitive restoration. Dorsey J. Moore et al. (1976) [5] described a technique which combines crowns with a maxillary prosthesis to guide the mandible into a functional occlusion.

Mohamed A. Aramany et al. (1977) [6] reported 14 patients who were treated by the use of immediate intermaxillary fixation after segmental resection of the mandible to eradicate cancerous lesions. They claimed that the use of intermaxillary fixation during the first 6 postoperative weeks reduces the degree of deviation. Fattore et al. (1988) [7] advocated a two piece gunning splint, both for intermaxillary fixation and as a guidance appliance for an edentulous patient, following hemisection of the mandible. Hasanreisoglu et al. (1992)[8] suggested that for dentate patients, palatal guide ramps or mandibular guide flange prostheses are indicated.

Beumer et al. (1996) [1] reported that if the mandible can be manipulated comfortably into an acceptable occlusion position, a cast metal guidance ramp will be appropriate. If some resistance is encountered in positioning the mandible, a guidance ramp of acrylic resin is suggested, as this material can be periodically adjusted as an improved relationship is obtained. They further stated that mandibular guidance therapy begins when the immediate post surgical sequelae have subsided, usually at about two weeks after surgery. Initially, the patient should be placed on an exercise program.

Nasrin Sahin et al. (2005) [9] described the fabrication of a cast metal guidance prosthesis with supporting flanges and retentive flanges for a patient, following a segmental mandibulectomy and claimed that the patient was able to achieve a functional intercuspal position after the insertion of the prosthesis. Joshi et al (2008) [10] described the fabrication of a mandibular guide flange prosthesis and suggested that a removable prosthesis is an effective alternative for most patients with mandibular defects, considering the poor prognosis, difficulty in decision making for the use of the implant and economic feasibility. Prencipe MA et al (2009) [11] described a technique by which only 1 mandibular prosthesis can be used both for physiotherapy and eating, by simply inserting and removing the guide flange. Two precision attachments were inserted into buccal surface of the denture base with their patrix and the corresponding matrixes were inserted into the transparent guide flange.

Mandibular resection prostheses should be provided to restore the mastication within the unique movement capabilities of the residual function in the mandible. A common feature among all removable resection prosthesis is that all framework designs should be detected by a basic prosthodontic design. These include broad stress distribution, cross arch stabilization by using a rigid major connector, stabilizing and retaining components at locations within the arch to minimize the dislodgement and the replacement of the tooth positions which optimize the prostheses. Stability and function needs modification to these principles, that are determined on an evidence basis and greatly influenced by unique residual tissue characteristics and mandibular movement dynamics.

Case Report

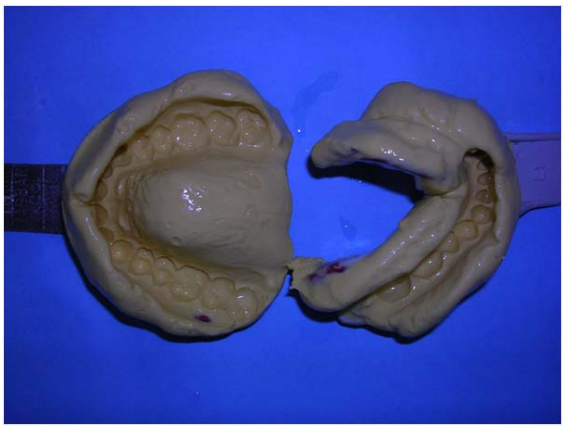
A 30 year old female reported to the Dental Prosthesis Service with a chief complaint of difficulty in mastication and speech. She had a unilateral discontinuity mandibular defect on the right side due to surgery for ameloblastoma. The surgery was performed 20 days back and reconstruction was done with muscle graft. No intermaxillary fixation was applied at the time of surgery. The patient was not financially sound.

Extraoral examination showed facial asymmetry with mandibular deviation to the right side. Clinical examination revealed severe deviation of the mandible towards the resected side, with lack of proper contact between the maxillary and the mandibular teeth. Intra oral examination showed missing teeth 43, 44, 45, 46, 47 and 48 [Table/Fig 1]. The mandibular defect was classified as Cantor and Curtis Class IV i.e. resection of the lateral portion of the mandible with subsequent augmentation to restore form and function[12].

[Table/Fig 1]: Pre-operative intraoral view showing mandibular deviation towards resected side.

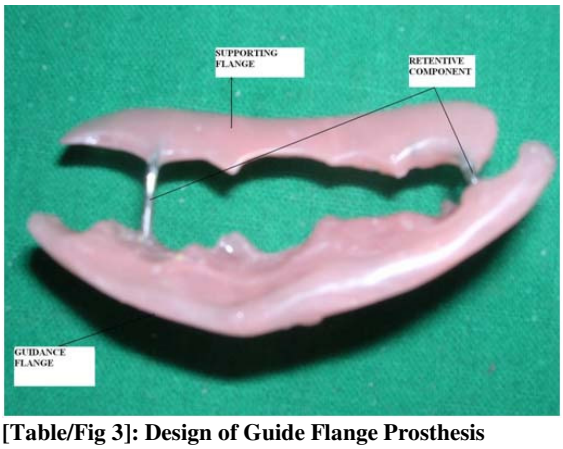
The patient was evaluated for the guide flange prosthesis. It was noted that the patient's mandible could be manually placed into the centric occlusion without excessive force. A mandibular based acrylic resection prosthesis with a buccal guiding flange was planned.

A maxillary and mandibular impression was made by using irreversible hydrocolloid. [Table/Fig 2]. The casts were poured with Type III dental stone. A maxillomandibular record was made by manually assisting the mandible into the centric occlusion. The maxillary and mandibular cast was mounted on a three point articulator.



[Table/Fig 2]: Impression made using Irreversible hydrocolloid.

The mandibular resection prosthesis was fabricated on the non defect (left) side. The design [Table/Fig 3] included the guidance flange on the buccal side and the supporting flange on the lingual side. The retention was provided by the interdental clasp, engaging the premolars and the molars. The guide flange extended superiorly and diagonally on the buccal surface of the molars and the premolars, allowing the normal horizontal and vertical overlap of the left maxillary teeth. The guide flange was sufficiently blocked out, so that it would not traumatize the left maxillary teeth and the gingiva when the patient closed her mouth. The prosthesis was finished, evaluated and inserted intraorally. [Table/Fig 4]



[Table/Fig 3]: Design of Guide Flange Prosthesis

The guide flange provided a mechanical system which prevented the mandible from turning

towards the resected side. The patient was advised to use the guide flange device throughout the day, except at night and during meals.

[Table/Fig 4]: Intraoral view of the patient with the Guide flange prosthesis.

Physiotherapy was suggested to assist the patient in improving the symmetrical arc of closure and in finding the centric occlusion position without guiding the mandible manually. The exercise consisted of the simple opening and closing of the mandible with and without the appliance. These movements tend to loosen scar contracture, reduce trismus and reprogram the remaining musculature to close the mandible into the centric occlusion. When prosthetic therapy is combined with a well organized exercise program, improved results can be achieved.

[Table/Fig 5]: Intraoral view of the patient with the Interim removable partial denture.

Three days after insertion of the prosthesis, the patient was able to achieve a functional intercuspal position without manual manipulation. After one week, the patient was evaluated for the insertion of the interim removable partial denture. The interim removable partial denture was fabricated for the patient with heat cure acrylic by utilizing the wrought wire clasp and by engaging the premolars and the molars to get retention. This prosthesis helped her to get accustomed to close the mandible into the correct intercuspal position without the use of any external aid. [Table/Fig 5]

In such patients, definitive partial denture restorations are deferred until an acceptable maxillomandibular relationship is obtained or an end point in mandibular guidance therapy is reached. Guidance prosthesis and interim removable partial denture serve as training appliances till a cast partial denture can be fabricated for the patient. Within 3 weeks, the mandible was guided to the correct occlusal position.

Discussion

Rehabilitation is an essential phase of cancer care and should be considered from the time of diagnosis in a complete and comprehensive treatment plan. The primary objective of rehabilitation is the restoration of appearance and function. Mandibular resection, as a consequence of surgical treatment of the tumour, will clinically result in facial asymmetry and malocclusion. The residual mandible deviates medially and superiorly and it will be more or less evident, depending on the location and the extension of the resection, the amount of soft tissue and innervations which are involved and the presence of the remaining natural teeth. A corrective device named 'guide flange prosthesis' is indicated to limit that clinical manifestation and to restore mandibular function.

This clinical report illustrates the prosthetic management of a patient who underwent mandibular resection due to surgery for ameloblastoma. The literature shows various types of cast metal guidance prostheses which are effective in managing the mandibular deviation. But such appliances are complex, the technique is sensitive and costly and they require a number of patient visits. The acrylic guide flange prosthesis which is presented here is a

simple and cost effective method for managing the mandibular deviation. The number of patient visits is also less as compared to the cast metal guidance prosthesis. The other advantage is its ease of adjustability.

The success of mandibular guidance therapy depends on the early beginning, the nature of the surgical defect and the patient's cooperation. Mandibular guidance therapy begins when the immediate postsurgical sequelae have subsided, usually within 2 to 3 weeks after surgery. This sort of therapy is most successful in patients whose resection involves only bone structures and minimally the tongue, the floor of the mouth and contiguous soft tissues. The presence of the teeth in both the arches is important for the effective guidance and the reprogramming of the mandibular movements. The patient in this clinical report retained all her teeth, except those on the defect site. Therefore, the patient had a better proprioceptive sense and was able to achieve the functional position after the insertion of the prosthesis.

The main purpose is to re-educate the mandibular muscles to re-establish an acceptable occlusal relationship (physiotherapeutic function) for the residual hemimandible, so that the patient can control the opening and closing of the mandibular movements adequately and repeatedly. This is the beginning of an accomplished prosthetic rehabilitation by using a removable prosthesis, by which artificial teeth could warrant a stable occlusion. For better results, the prosthetic management can be combined with an exercise program that can be started 2 weeks after the surgery. On opening completely, the mandible can be displaced by hand as forcefully as possible towards the nonsurgical side. These movements tend to lessen scar contracture, reduce trismus, and improve maxillomandibular relationships.

Conclusion

Because mandibular guidance therapy is most successful in patients whose resection involve only bony structures with minimal loss of soft tissue and no radical neck dissection or radiation therapy, the patients who are treated for ameloblastoma are ideal candidates for the use of a mandibular guidance therapy. For better results, the prosthetic management should be combined with an exercise program.

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